

Exhibit 1

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN

UNITED STATES OF AMERICA)	
)	
)	
Plaintiff,)	Civil Action No.
)	
v.)	
)	
DTE ENERGY COMPANY, and)	
DETROIT EDISON COMPANY)	
)	
)	
Defendants.)	
_____)	

Declaration of Lyle Chinkin

I, Lyle Chinkin, declare as follows:

1. I am the President of Sonoma Technology, Inc. ("STI"), which specializes in air quality and meteorological research and services. I joined STI in 1992 and have worked on projects for federal, state, and local government agencies; universities; public and private research consortiums; and major corporations. My resume is attached as Exhibit A.
2. I received Master of Science (1984) and Bachelor of Science (1981) degrees in Atmospheric Sciences from the University of California at Davis.
3. I have over 20 years of experience in professional consulting regarding air quality and over five years of experience at the California Air Resources Board. I have been appointed to and served on the National Research Council of the National Academy of Sciences Committee on the Effects of Changes in New Source Review Programs for Stationary Sources of Air Pollutants. I have also been appointed to and served on a panel

to review “Improving Emission Inventories for Effective Air Quality Management Across North America, a NARSTO Assessment”. I have also served as a United States Environmental Protection Agency (EPA) invited peer-reviewer of the EPA particulate matter (PM) National Ambient Air Quality Standards (NAAQS) Criteria Document, an expert panel member for the review of the Valdez Air Health Study, and as an expert witness for the United States Department of Justice (DOJ) in environmental enforcement actions. My resume is Appendix A to this declaration, a list of publications is found at Appendix B, and my compensation for this matter is provided at Appendix C. My testimony as an expert witness is listed at Appendix D.

4. On behalf of EPA, DOJ has requested an analysis of the estimated air quality impacts associated with excess emissions from Unit 2 of DTE Energy’s Monroe coal-fired power plant located in Monroe, Michigan. My conclusions are still being developed, and could be affected by information or analysis that has yet to be produced. Thus, these conclusions do not represent my final opinions, but rather a reasonable preliminary description of my opinions in this case. A list of documents considered in forming these opinions is provided at Appendix E to this declaration.

5. DTE Energy’s Monroe power plant is the eleventh largest coal fired plant in the United States, with 4 generating units providing a total output of over 3,100 megawatts (MW).¹ In 2005, the Monroe power plant was also the eleventh largest sulfur dioxide (SO₂) emitter in U.S., emitting a total of 110,306 tons of SO₂. Though emissions control systems have been installed on other units at the Monroe power plant, Unit 2, an 823 MW unit, is currently uncontrolled. In 2009, Monroe Unit 2 emitted 27,230 tons of SO₂ and

¹ Based on power plant rankings published by the U.S. Energy Information Administration (see <http://www.eia.doe.gov/neic/rankings/plantsbycapacity.htm>).

8,205 tons of NO_x, making it the largest individual (i.e., unit level) source of both pollutants in the state of Michigan that year. And on average, this unit has emitted 26,403 tons per year (tpy) of SO₂ and 9,618 tpy of oxides of nitrogen (NO_x) since 2000. Figures 1 and 2 show annual variations in SO₂ and NO_x emissions for Unit 2 of the Monroe plant for years 2000 through 2009, as measured by continuous emissions monitoring.

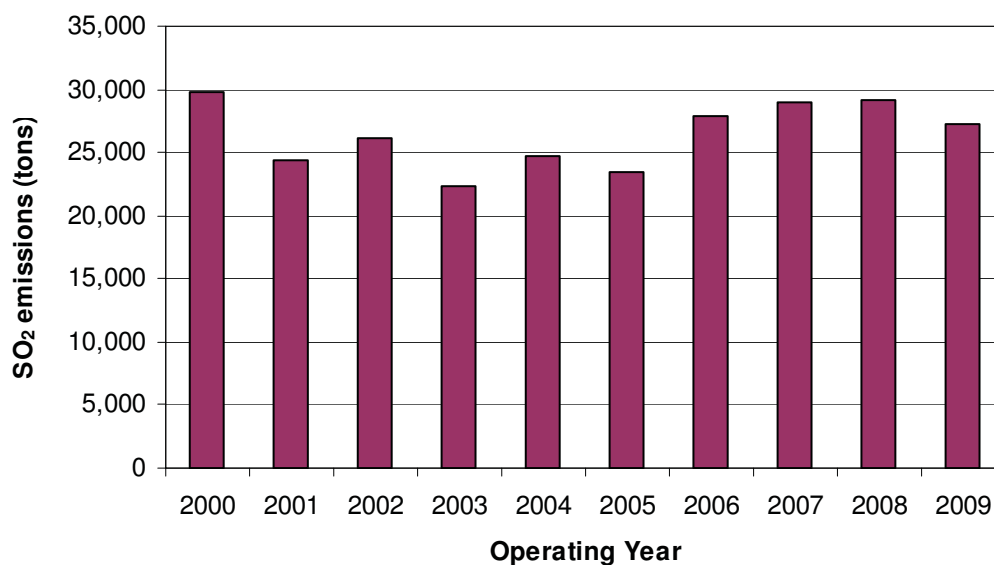


Figure 1. Historical SO₂ emissions from Unit 2 of the Monroe power plant.

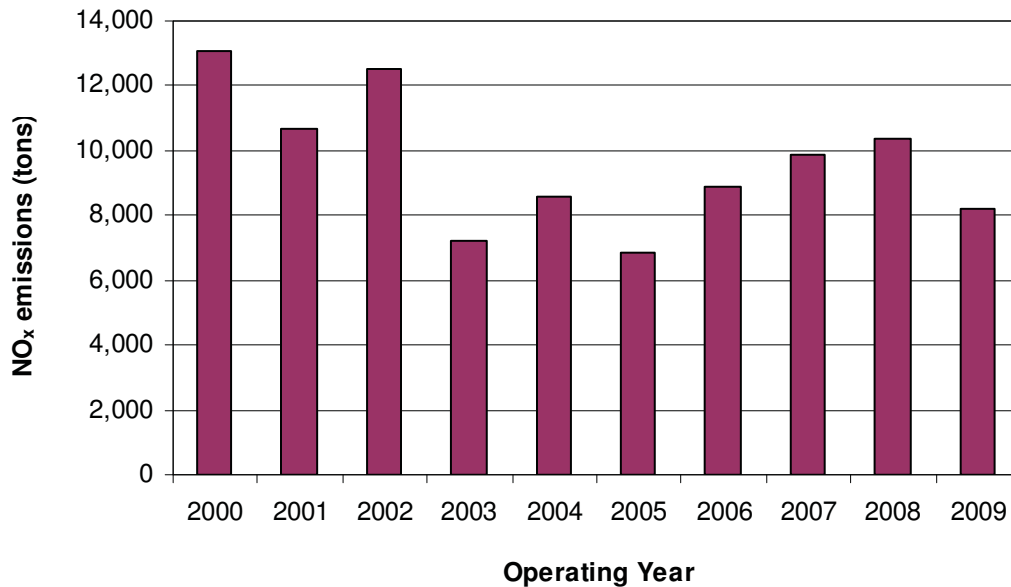


Figure 2. Historical NO_x emissions from Unit 2 of the Monroe power plant.

6. I understand that DTE Energy made significant modifications to Monroe Unit 2 in 2010 which should have triggered New Source Review (“NSR”) for SO₂ and NO_x at Unit 2. If NSR had been conducted at the time of these modifications, pollution controls would have been required on these units. The installation of pollution control technologies on Unit 2 at the time of its modifications could have reduced the emissions of SO₂ by 95% or more and NO_x by 90% or more from that point forward, compared to emissions that were actually released. The amount of emissions in excess of what would have been emitted with pollution controls is referred to as “excess emissions.” Based on the most recent annual emissions data for Monroe Unit 2 (year 2009), we modeled excess emissions from Unit 2 of to 25,869 tons of SO₂ and 7,384 tons of NO_x per year, which we understand to be a conservative estimate of emissions. These estimates are in keeping with historical emissions from Monroe Unit 2, which has emitted 26,403 tons per year of SO₂ and 9,618 tons per year of NO_x, on average, over the past 10 years.

7. To place the excess emissions from Monroe Unit 2 in context, I made the following comparisons between the excess emissions cited above and other sources in the region identified in EPA's 2005 National Emissions Inventory (NEI).

- Based on 2009 emissions, the excess SO₂ emissions (25,869 tons) are equivalent to the annual emissions of 371,000 heavy-duty (HD) trucks, or all the trucks registered in Michigan, Illinois, Ohio and Indiana combined (see **Figure 3**).
- The excess SO₂ emissions at Monroe Unit 2 are equivalent to the 6th largest point source in Michigan (out of 1614 point sources in the 2005 NEI) – If all Monroe emissions are considered, it is the largest point source in Michigan.
- The largest non-utility point source of SO₂ in the Detroit-Ann Arbor nonattainment area is the Holcim facility in Monroe, Michigan, one of the nation's largest manufacturers and distributors of cement and mineral products. The Holcim plant emitted 7,129 tons of SO₂ in 2005, making the excess SO₂ emissions from Monroe Unit 2 equivalent to the output of more than 3 Holcim plants.
- The excess SO₂ emissions at Monroe Unit 2 are more than the SO₂ emissions from all 405 non-EGU point sources in the Detroit-Ann Arbor nonattainment area combined.
- The largest non-utility point source of SO₂ in city of Detroit is the United States Steel Corp Great Lakes Works, which emitted 4,431 tons of SO₂ in 2005. The excess emissions at the Monroe Unit 2 are equivalent to the output of five United States Steel Corp Great Lakes Works plants.
- The largest non-utility point source of SO₂ in Cleveland is the DiGeronimo Aggregates facility, a producer of concrete aggregates, which emitted 841 tons of SO₂ in 2005. The excess emissions at the Monroe Unit 2 are equivalent to the output of 30 DiGeronimo Aggregates facilities.
- The excess NO_x emissions at Monroe Unit 2 are equivalent to the emissions of about 1 million passenger cars, or one quarter of all passenger cars registered in Michigan (see **Figure 4**).
- The excess NO_x emissions at Monroe Unit 2 are equivalent to the 7th largest point source in Michigan (out of 1614 point sources in the 2005 NEI) – If all Monroe emissions are considered, it is the largest source.
- The largest non-utility point source of NO_x in the Detroit-Ann Arbor nonattainment area is the United States Steel Corp Great Lakes Works in Wayne, Michigan, which emitted 3,290 tons of NO_x in 2005. The excess NO_x emissions from Monroe Unit 2 are equivalent to the output of more than two United States Steel Corp Great Lakes Works plants.



Excess SO₂ emissions from
the Monroe Power Plant

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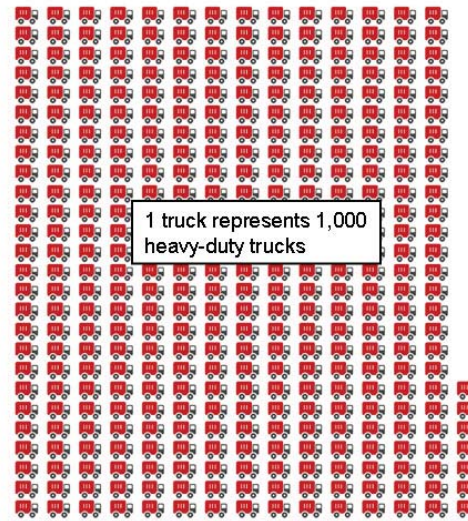


Figure 3. The excess SO₂ emissions from the Monroe Unit 2 are equal to the SO₂ emissions from 371,000 heavy-duty trucks or all of the heavy-duty trucks registered in Michigan, Illinois, Ohio, and Indiana combined.



Excess NO_x emissions from
the Monroe Power Plant

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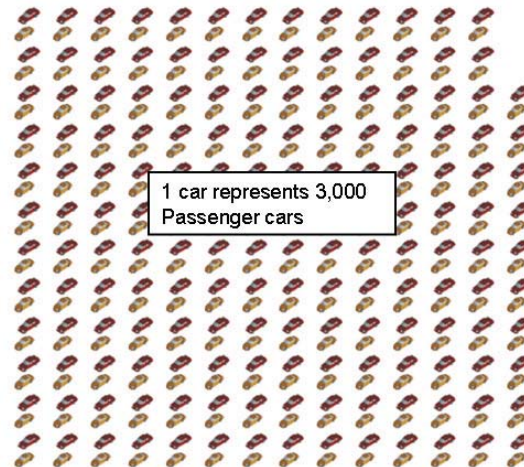


Figure 4. The excess NO_x emissions from the Monroe Unit 2 are equal to the NO_x emissions from about 1 million passenger cars or one quarter of all passenger cars registered in Michigan.

8. The emissions of SO₂ and NO_x from Monroe Unit 2 form sulfate and nitrate particles, respectively, which contribute to the secondary formation of fine particulate matter (PM) in the atmosphere. Secondary PM forms when precursor gases undergo chemical and physical transformations in the atmosphere. (Primary PM, on the other hand, is directly emitted into the atmosphere and includes suspended dust, sea salt,

organic carbon, elemental carbon, metals from combustion, and small amounts of sulfate and nitrate.) In particular, SO₂ emissions form sulfate particles which, along with carbon, dominate the composition of PM_{2.5} throughout the eastern United States. In addition, PM is a complex mixture of solid and liquid particles, with the size of particles in the atmosphere varying tremendously. Particle sizes are often classified in three size ranges:

- Ultra-fine particles (<0.1 µm),
- Fine particles (0.1 to 2.5 µm), and
- Coarse particles (2.5 to 10 µm).

where 1 µm is 1 millionth of a meter. When we refer to PM_{2.5} we mean the concentration of particles that are less than 2.5 µm (i.e., particles in the fine and ultra-fine size ranges), while PM₁₀ includes the sum of PM_{2.5} and coarse particles. **Figure 5** provides a size comparison of PM_{2.5} and PM₁₀ particles to human hair and beach sand.

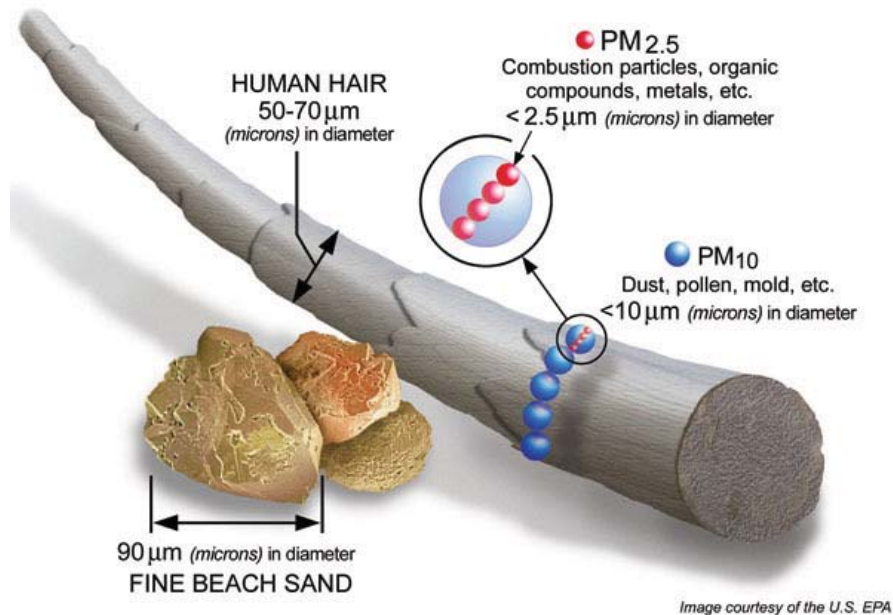


Figure 5. Size comparison of PM_{2.5} and PM₁₀ particles to human hair and beach sand.

9. Because of health effects associated with $PM_{2.5}$, EPA has established national ambient air quality standards (NAAQS) for $PM_{2.5}$ of 15 micro-grams per cubic meter ($\mu\text{g}/\text{m}^3$) for an annual average and $35 \mu\text{g}/\text{m}^3$ for a daily average. However, EPA's Ambient Standards Group has recently released a draft policy assessment which concludes that consideration should be given to lowering annual $PM_{2.5}$ standard levels to the range of 11 to $13 \mu\text{g}/\text{m}^3$, and that consideration should also be given to lowering the 24-hr (daily) $PM_{2.5}$ standard to $30 \mu\text{g}/\text{m}^3$ in conjunction with an annual standard of $11 \mu\text{g}/\text{m}^3$ (U.S. Environmental Protection Agency, 2010). These lower standards have been endorsed by the Clean Air Scientific Advisory Committee (CASAC), a key EPA advisory group (Williams, 2010). **Figure 6** shows areas currently classified as nonattainment based on the EPA's annual and 24-hr standards.

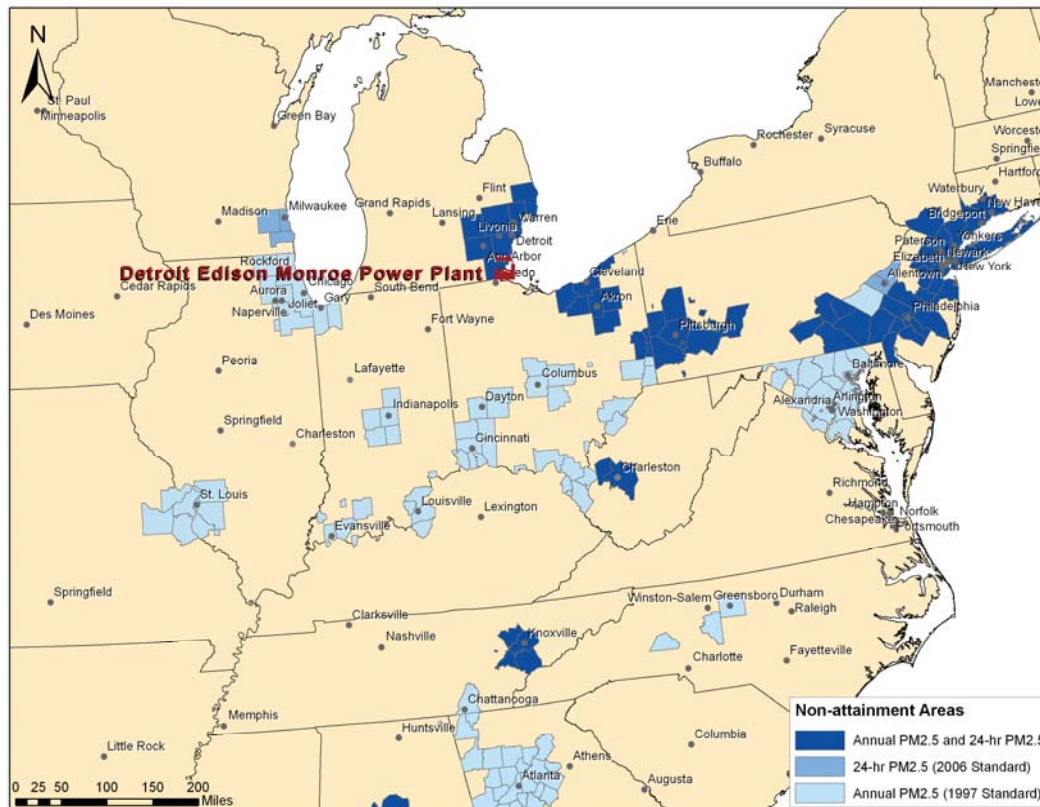


Figure 6. Annual and 24-hr PM_{2.5} nonattainment areas in the region around the Monroe power plant.

10. The emissions of NO_x from the Monroe power plant form ozone in the lower atmosphere. Ozone is a secondary pollutant formed through the photochemical reactions of NO_x, volatile organic compounds (VOCs), and sunlight. The precursors to ozone (VOC and NO_x) are emitted into the atmosphere by both anthropogenic (man-made) and biogenic (naturally occurring) sources. Ozone in the lower atmosphere is an air pollutant with harmful effects on the respiratory systems of animals (including humans) and damaging to plants; however, the ozone layer in the upper atmosphere is beneficial, preventing potentially damaging ultraviolet light from reaching the Earth's surface. Because of health effects associated with ozone, EPA has established NAAQS for ozone, which is 75 parts per billion (ppb) for a peak 8-hour average. **Figure 7** shows areas

currently classified as nonattainment of this ozone standard and areas requiring ozone maintenance plans.

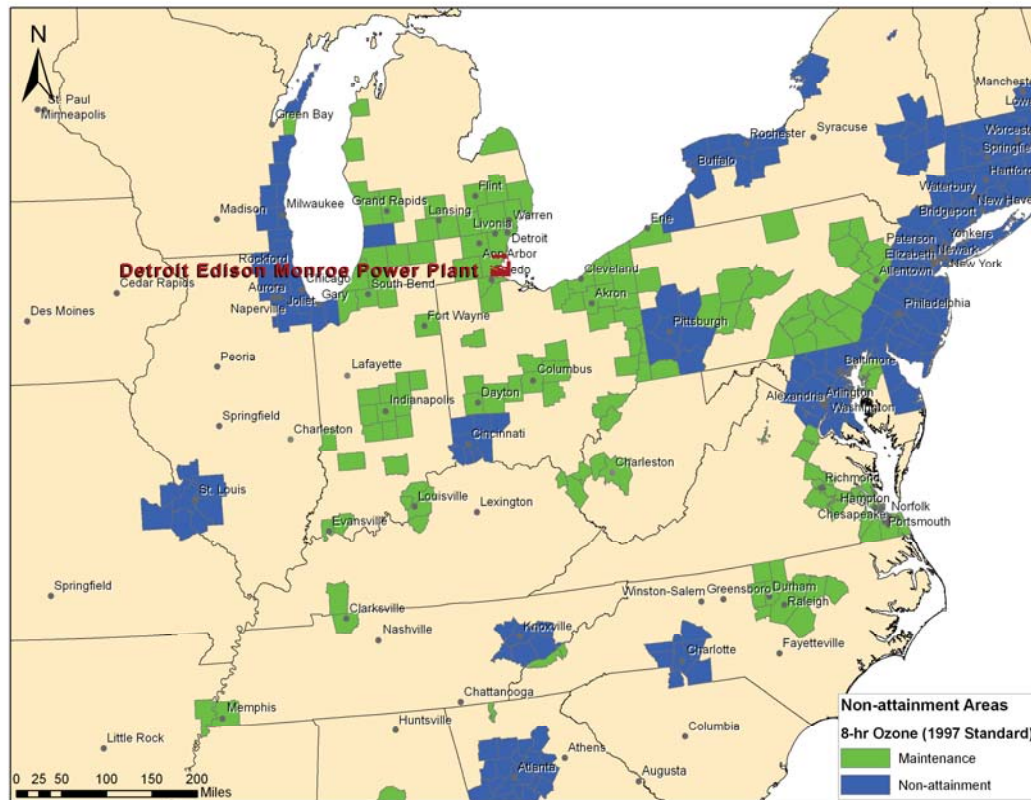


Figure 7. Ozone nonattainment and maintenance areas in the region around the Monroe power plant.

11. I reviewed the first six months of this year's (2010) ozone and $PM_{2.5}$ air quality data for nonattainment areas within 250 miles of the Monroe power plant. In the eastern and mid-western US most exceedances of the standards for these pollutants occur in the summer and autumn months. Even though it is early in the ozone and $PM_{2.5}$ year there have been numerous exceedances of the standards already. The number of exceedances is summarized in **Table 1**.

Area	Number of Days Exceeding the 24-hr PM _{2.5} Standard	Number of Days Exceeding the Ozone Standard
Buffalo, NY	0	1
Pittsburg, PA	12	3
Cincinnati, OH	5	5
Cleveland, OH	28	3
Milwaukee, WI	6	2
Chicago, IL	6	3
Detroit, MI	1	2
Allegan, MI	0	0

Table 1. Summary of ozone and PM_{2.5} exceedances days in nonattainment areas from January through June, 2010.

12. The excess SO₂ and NO_x emissions from the Monroe power plant contribute to the formation of PM_{2.5} in nearby Detroit, throughout Michigan, in neighboring states, and in other states in the mid-eastern and eastern United States. Several of the areas impacted by the Monroe power plant are not in attainment of the NAAQS for PM_{2.5}, meaning that the excess emissions are adding to areas that already have unhealthy air quality levels. These areas include Detroit-Ann Arbor, Michigan, Cleveland-Akron-Lorain, Ohio, and Milwaukee-Racine, Wisconsin.

13. In consultation and coordination with colleagues at STI, I assessed the air quality impacts of the excess emissions from the Monroe power plant using an air quality model to better quantify these impacts. Air quality models are mathematical descriptions of pollution transport, dispersion, and related processes in the atmosphere and have been in use for decades and shown to be reliable. Air quality models estimate the air pollutant concentration at many locations, which are referred to as receptors. The number of receptors in a model far exceeds the number of monitors one could typically afford to deploy in a monitoring study. Therefore, models provide a cost effective way to analyze

impacts over a wide spatial area where factors such as meteorology, topography, chemistry, and emissions could be important. Air quality models are also appropriate tools to examine the air quality impacts of proposed regulations and policies. Air quality agencies and businesses regularly use these models to evaluate the sensitivity of air pollution concentrations to changes in emissions sources, which aids in decision making about emission control strategies. Predicting pollutant concentrations associated with future emission scenarios is another important use of air quality models.

14. Specifically, the state-of-the-science, peer-reviewed Comprehensive Air Quality Model with extensions (CAMx) model was used for this assessment. CAMx is an Eulerian photochemical model capable of simulating the emission, transport, diffusion, chemical transformation, and removal of gaseous and particle pollutants in the atmosphere on a three-dimensional array of grid cells (see **Figures 8 and 9**). Eulerian models are technically superior to and a more complete scientific representation of atmospheric processes than other models commonly used in air quality assessment and management, such as Gaussian and Lagrangian models, because they allow more comprehensive, explicit treatment of physical processes and include the interactions of numerous sources for chemical processes. Eulerian models operate on a computational grid (hence the term “grid models”), require sophisticated solution methods, and employ discrete time steps and operator splitting. These models rely on fewer assumptions but require high-speed computers and sophisticated numerical integration methods. Besides CAMx, other examples of Eulerian photochemical models include the Urban Airshed Model (UAM-IV and UAM-V), the Multiscale Air Quality Simulation Platform (MAQSIP), and the Community Multiscale Air Quality model (CMAQ). The ability of

Eulerian photochemical models to treat large numbers of sources and their chemical interactions makes them well suited for assessing the impacts of emission controls on urban and regional air quality. These models are reliable, having been used for over 25 years in developing State Implementation Plans (SIPs) for ozone under the Clean Air Act, and in the past seven years their use has been expanded to assessments of PM and hazardous air pollutants. Eulerian photochemical models are used worldwide, and both CAMx and CMAQ are widely used to support policy and regulatory decisions across the U.S. Example applications of CAMx include:

- Regional Haze/Visibility Modeling by various Regional Planning Organizations (RPOs), including the Visibility Improvement State and Tribal Associations of the Southeast (VISTAS), the Central Regional Air Planning Association (CENRAP), the Western Regional Air Partnership (WRAP), and the Midwest Regional Planning Organization (MRPO).
- Local PM modeling in support of the preparation of PM SIPs for St. Louis, Missouri and Boise, Idaho.
- Regional modeling (eastern U.S.) by EPA in support of analyses of EPA's Heavy-Duty Diesel Rule and Clean Air Interstate Rule (CAIR).
- BART modeling to evaluate the impact of best available retrofit technology (BART) controls at large stationary sources in Texas and Arkansas.

In addition, formal scientific reviews of the CAMx model have been widely carried out since the model was first introduced in the mid 1990s (Russell and Dennis, 2000; McNally and Tesche, 1998). More than two dozen governmental, academic, industrial, and private modeling groups have reviewed the model code as part of training, model set-up, performance evaluations, regulatory applications, and quality assurance activities.

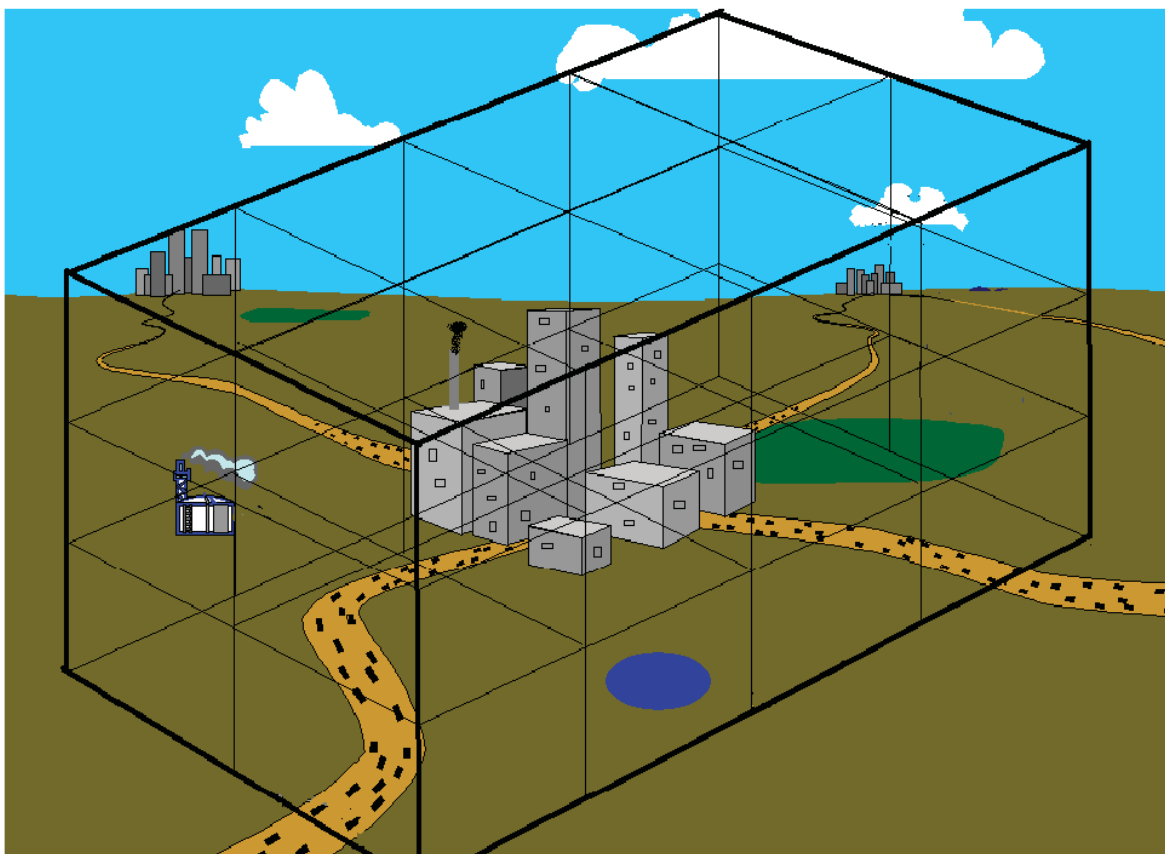


Figure 8. Photochemical grid model conceptualization.

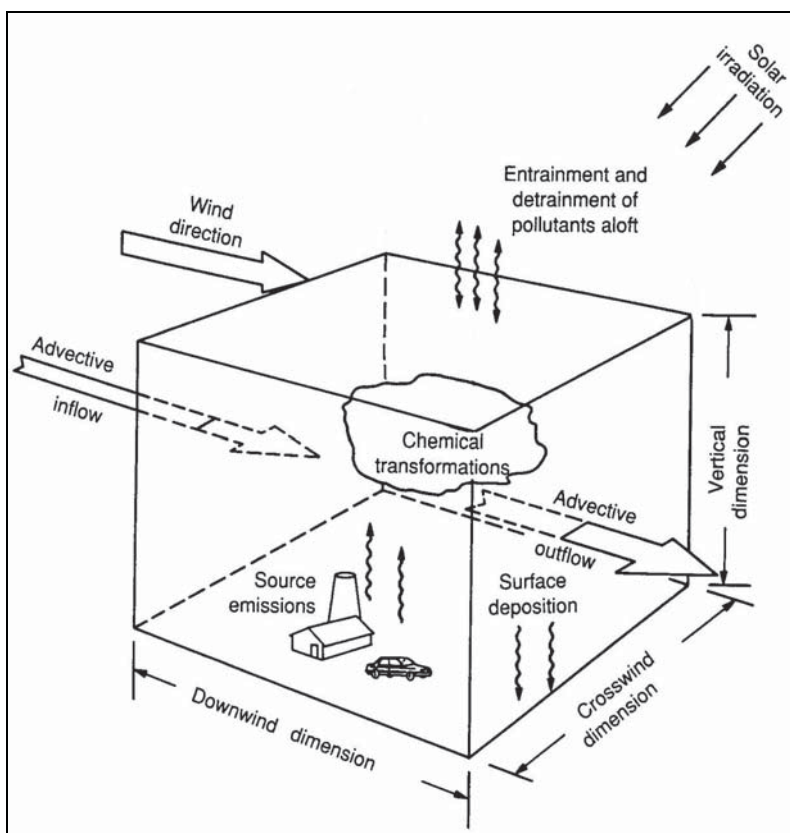


Figure 9. Overview of processes treated in a single grid cell of an Eulerian photochemical model.

15. The CAMx modeling system simulates various chemical and physical processes that are important for understanding atmospheric trace gas transformations and distributions and contains three types of modeling components: (1) a meteorological modeling system for the description of atmospheric states and motions; (2) emission models for characterizing man-made and natural emissions that are injected into the atmosphere; and (3) a chemistry-transport modeling system for simulating the chemical transformation and fate of air pollutants. In addition, the CAMx modeling system includes particulate matter source apportionment technology (PSAT), a source apportionment tool that can be used to estimate the contributions of individual sources or groups of sources to PM concentrations at selected receptor locations. Chemical

transport models, such as CAMx, mix emissions from different sources together. A source apportionment approach can be used to estimate the contributions of individual sources or groups of sources to PM concentrations at selected receptor locations. PSAT is a source apportionment tool developed for CAMx to track the formation and transport of PM_{2.5} from emissions source categories (e.g., mobile, point, biogenic, etc.) and geographic source regions. PSAT can track source contributions to sulfate, nitrate, ammonium, secondary organic aerosol (SOA), and several primary PM species (e.g., elemental carbon, primary organic aerosol, and crustal PM). PSAT has been tested for primary PM species, as well as secondary sulfate and nitrate PM species and can be useful for understanding model performance, designing PM emission control strategies, and performing culpability assessments to identify sources that contribute significantly to PM pollution (ENVIRON International Corporation, 2008).

16. To demonstrate the quantified impacts of the excess emissions, we used results from a CAMx PSAT modeling run performed by the U.S. EPA in support of the 24-hour PM_{2.5} NAAQS designation process (Baker and Timin, 2008). These are the same modeling results that I relied upon to reach conclusions about the impacts of the Wabash River Power Plant in a previous case (United States of America, et al. v. Cinergy Corp., et al. C.A. No. IP99-1693 C-M/S). EPA applied CAMx version 4.5 with full gas-phase and aerosol chemistry for the entire year of 2005, using a national 36 km resolution domain to supply boundary conditions to three nested 12 km resolution regional modeling domains. (Domain refers to the geographic area that is modeled.) PSAT results from the regional domain shown in **Figure 10** were used in this evaluation. These CAMx PSAT source apportionment results quantified impacts on PM_{2.5} concentrations from

facilities which were among the top 5% of all stationary point sources of NO_x, SO_x, or primary PM_{2.5} in the eastern half of the U.S., including the Monroe power plant. To estimate the impact of excess emissions from Unit 2 of the Monroe plant, the overall PSAT results for Monroe were scaled by multiplying the PSAT impacts from the Monroe power plant by the ratio of 2009 excess emissions to the total emissions from the Monroe power plant in the year modeled (2005). This scaling approach was applied to PSAT impacts associated with sulfate, elemental carbon, and crustal PM, which would be impacted by the 95% SO₂ reduction resulting from controls, and nitrate, which would be impacted by the 90% NO_x reduction resulting from controls. This approach assumes a linear relationship between primary precursor emissions and secondary PM_{2.5} production, a generally accepted assumption in the air quality modeling community. It should also be noted that EPA evaluated model performance for the 2005 base case used in CAMx PSAT runs by comparing model estimates to observations of chemically speciated PM_{2.5} collected at ambient monitoring sites during 2005. Metrics used to evaluate model performance include mean bias, gross error, fractional bias, and fractional error. For the Midwestern domain that is of interest to this study, model results for sulfate were found to be acceptable by EPA (Baker and Timin, 2008).

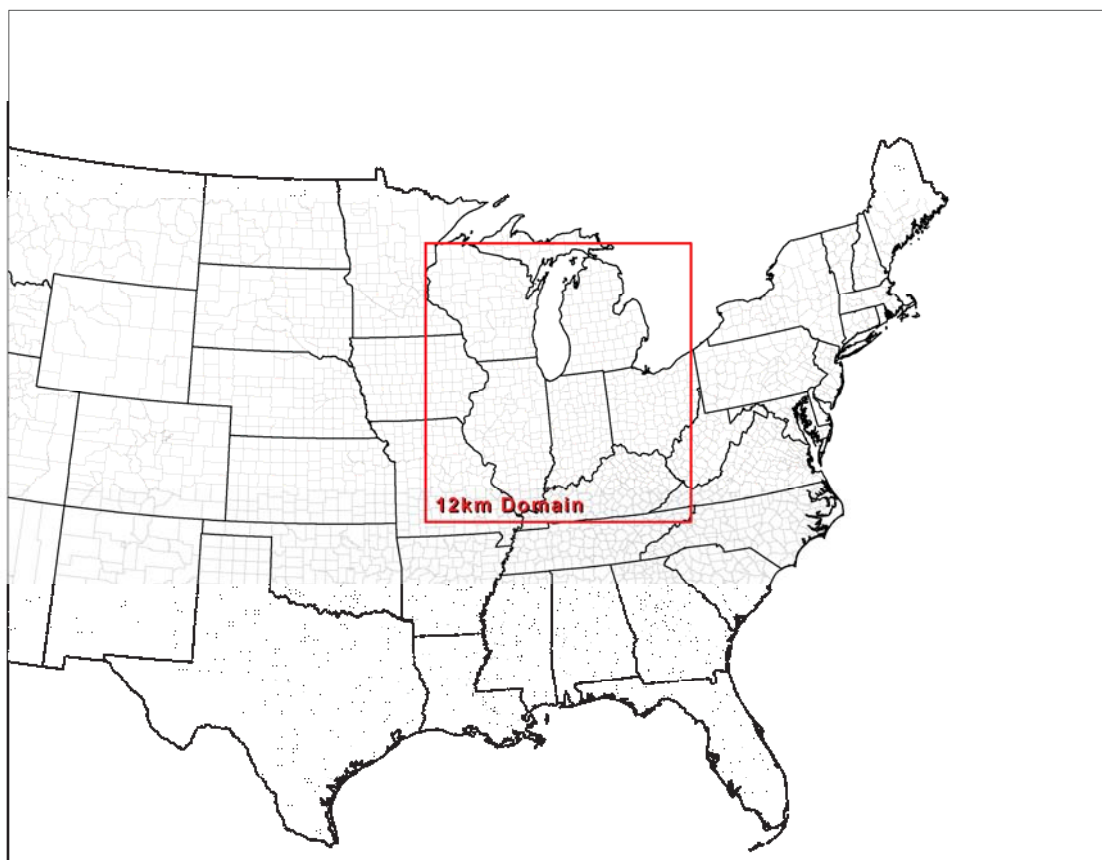


Figure 10. EPA modeling domain used for CAMx PSAT modeling.

17. Though the CAMX PSAT modeling performed by EPA was representative of 2005 meteorological conditions, an inspection of key meteorological parameters demonstrated that 2005 was not an unusual meteorological year. Several meteorological parameters are widely known in the air quality community to be good predictors of stagnation conditions that lead to poor air quality, including the temperature at 850 mb (about 5,000 feet above the ground) and the height of the 500 mb pressure surface.

Figures 11 and 12 show monthly 850 mb temperatures and 500 mb geopotential heights for 1948 to 2008 derived from data from the NOAA-CIRES Climate Diagnostic Center reanalysis project (NOAA-CIRES Climate Diagnostic Center, 2003), which uses a state-of-the-art analysis/forecast system to perform data assimilation using past data from 1948 to

the present. The vertical blue line on these plots delineates the year 2005, and an inspection of these time series plots demonstrates that 2005 was not an unusual meteorological year and that our air quality analyses are representative of other historical years and will likely be representative of future years as well.

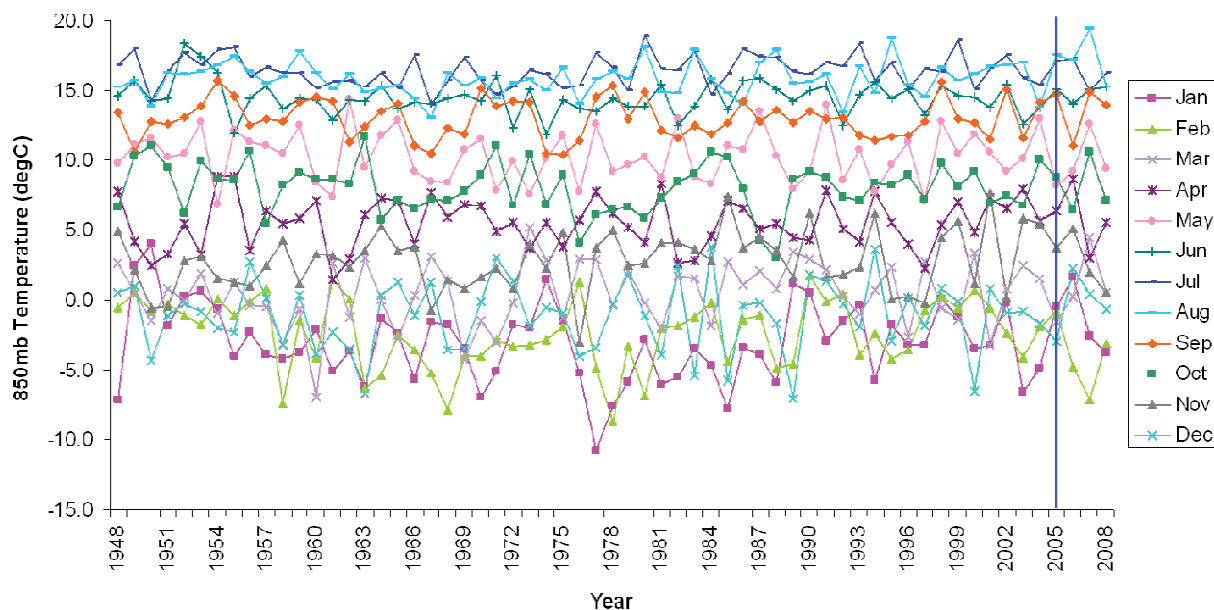


Figure 11. 850-mb temperatures (°C) by month over the Midwest and Northeast United States from 1948 to 2008. The vertical blue line delineates the year 2005.

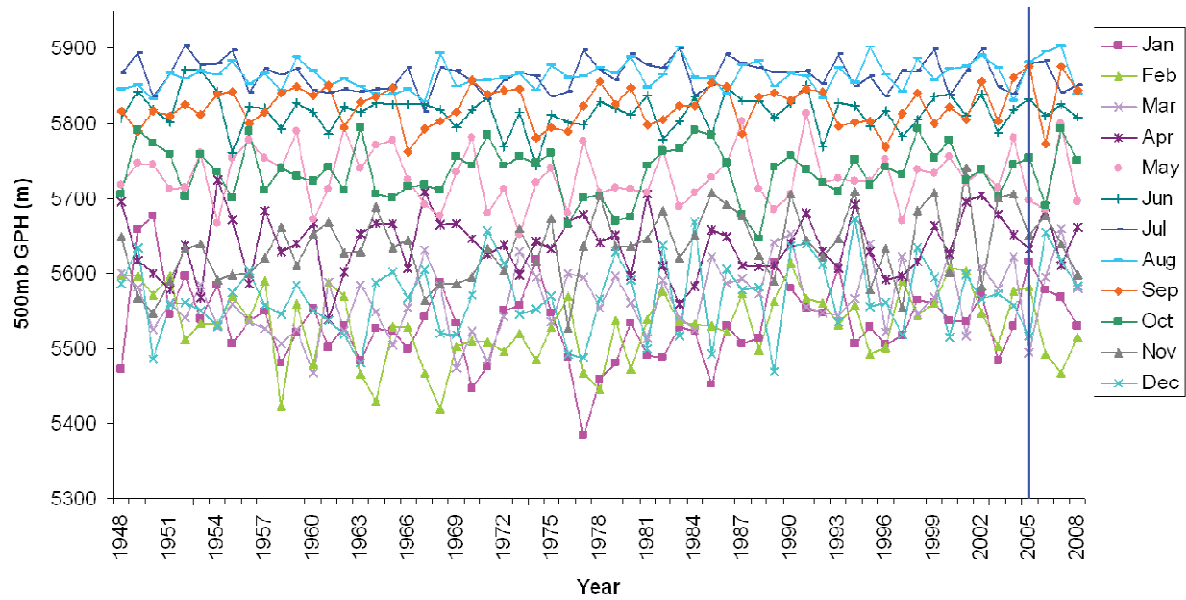


Figure 12. 500-mb geopotential heights (m) by month over the Midwest and Northeast United States from 1948 to 2008. The vertical blue line delineates the year 2005.

18. CAMx PSAT modeling results show that excess emissions from Unit 2 of the Monroe power plant have an impact of at least $0.5 \mu\text{g}/\text{m}^3$ on $\text{PM}_{2.5}$ concentrations in the Detroit-Ann Arbor non-attainment area on 23 days in 2005, with impacts as high as $1.5 \mu\text{g}/\text{m}^3$ occurring on July 28 and August 17. In addition, excess emissions from Monroe Unit 2 have impacts as high as $0.9 \mu\text{g}/\text{m}^3$ in the Cleveland-Akron-Lorain non-attainment area in 2005, and as high as $0.3 \mu\text{g}/\text{m}^3$ in Milwaukee-Racine non-attainment area (see **Table 2**). To illustrate the $\text{PM}_{2.5}$ air quality impacts of the excess SO_2 emissions from the Monroe power plant, **Figure 13** provides sample CAMx-PSAT modeling results for August 17, 2005. The CAMx model provides an estimate of how the excess SO_2 emissions impacted $\text{PM}_{2.5}$ pollution levels on that day. As shown in the figure, the impacts from the excess emissions from the Monroe power plant on $\text{PM}_{2.5}$ concentrations are greatest in Monroe County, Michigan, reaching about $1.5 \mu\text{g}/\text{m}^3$ on August 17. In

addition, impacts from the Monroe power plant's excess emissions exceed $0.5 \mu\text{g}/\text{m}^3$ across a large area that includes southeastern Michigan and northern parts of Ohio and Indiana, and the zone of impacts in excess of $0.25 \mu\text{g}/\text{m}^3$ extends beyond Michigan, Indiana, and Ohio to cross the central part of Illinois. On an annual basis, the impacts from the Monroe plant's excess emissions on $\text{PM}_{2.5}$ concentrations are greatest in Monroe County, reaching $0.1 \mu\text{g}/\text{m}^3$ (see **Figure 14**). Because of the law of conservation of mass, excess emissions from Monroe Unit 2 cannot be destroyed but only shifted in space or transformed; therefore, these emissions impact the air quality in some location every day of the year. To demonstrate this fact, the CAMx PSAT modeling results for every day of 2005 are provided in the DVD attached as Appendix F to this declaration.

Non-attainment area	Maximum impact on 24-hr $\text{PM}_{2.5}$ concentrations ($\mu\text{g}/\text{m}^3$)	Date(s) of maximum impact on 24-hour $\text{PM}_{2.5}$ concentrations
Detroit-Ann Arbor, MI	1.5	July 28 and August 17
Cleveland-Akron-Lorain, OH	0.9	February 4
Milwaukee-Racine, WI	0.3	July 12

Table 2. Peak modeled impacts on year-2005 $\text{PM}_{2.5}$ concentrations from excess emissions from Unit 2 of the Monroe power plant.

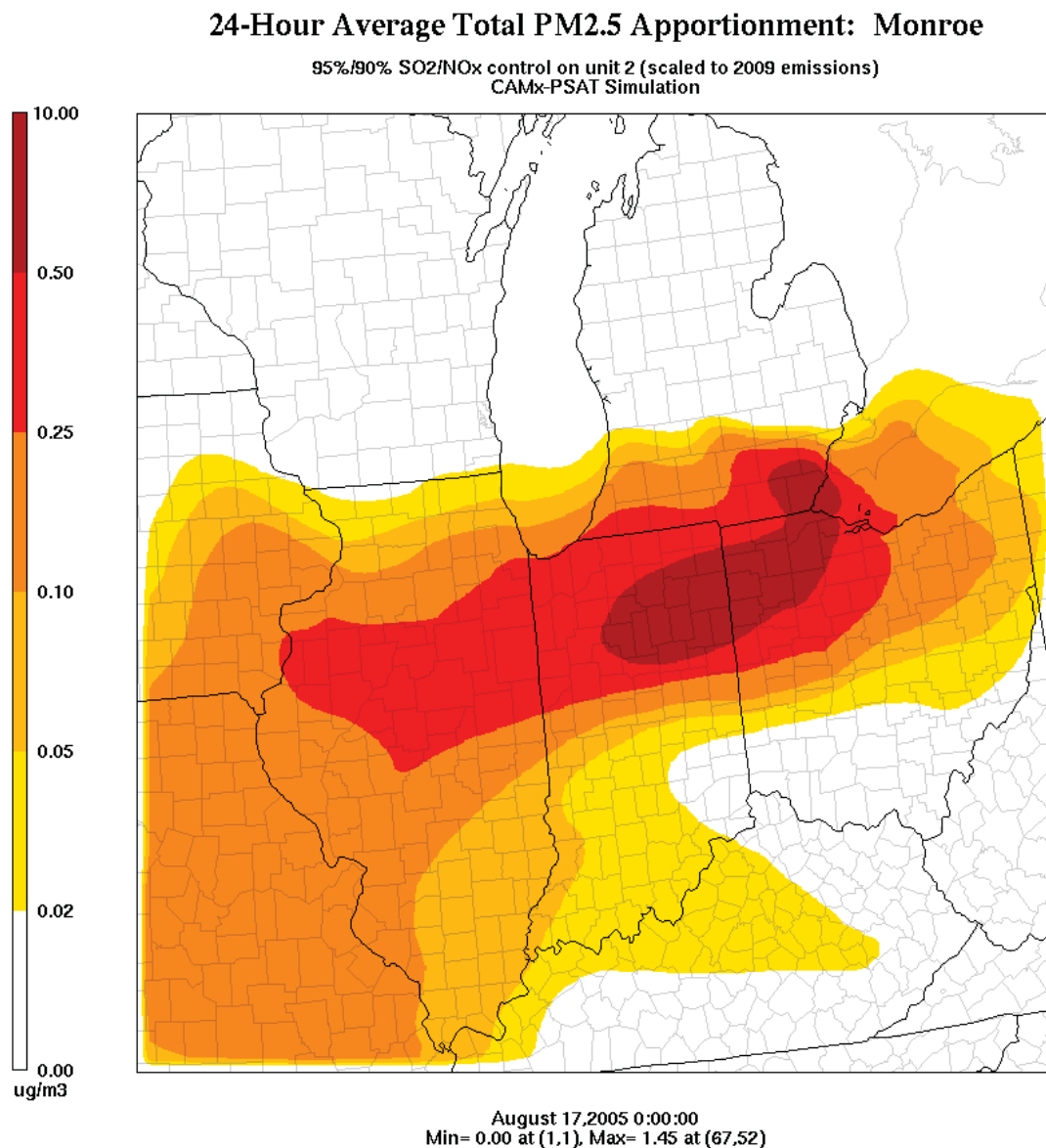


Figure 13 . CAMx-predicted impact on 24-hour average PM_{2.5} concentrations for August 17, 2005 from the current excess emissions at the Monroe power plant.

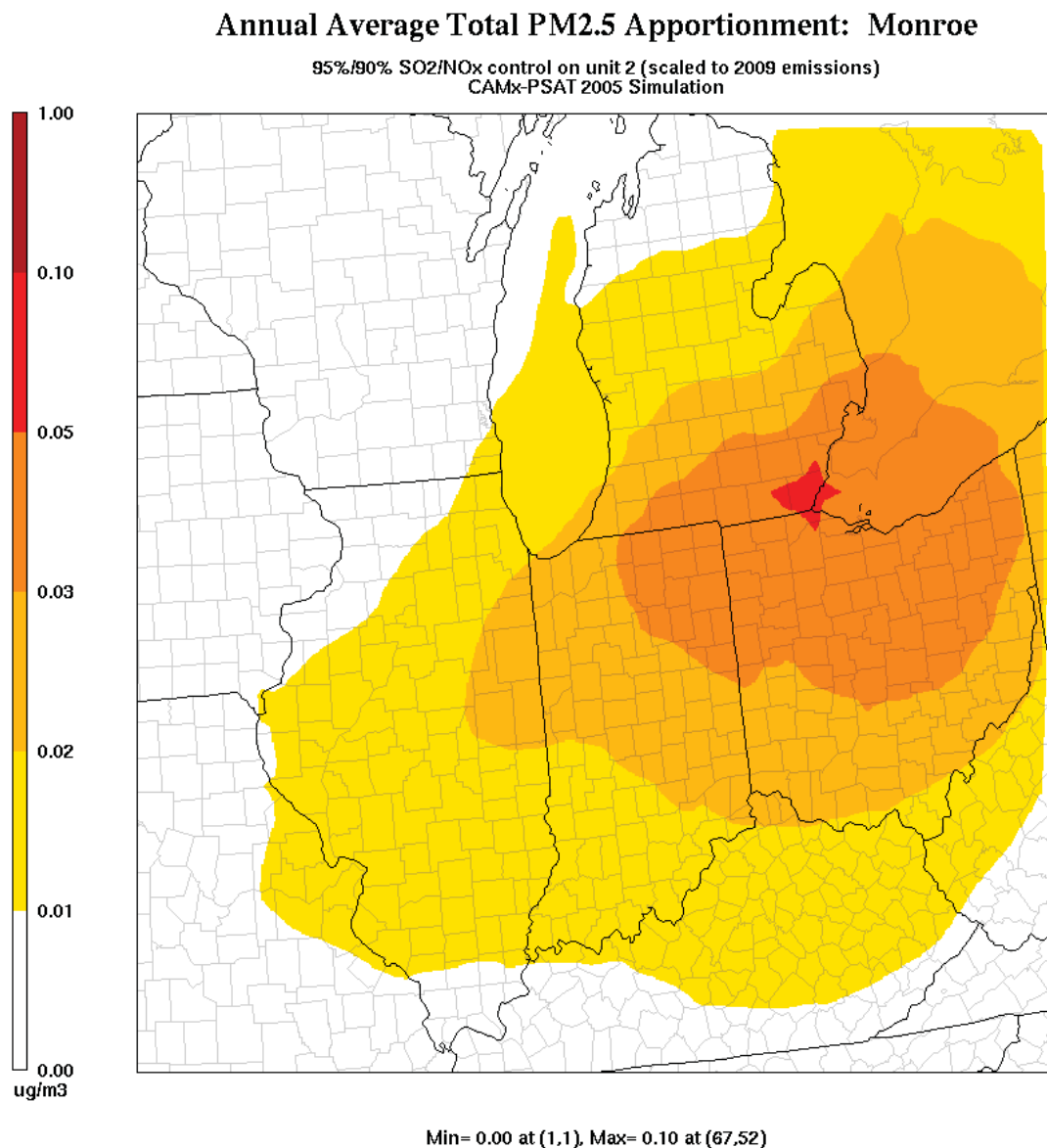


Figure 14. CAMx-predicted impact on annual average PM_{2.5} concentrations from excess emissions at the Monroe power plant.

19. To put these impacts in perspective, the current 24-hr PM_{2.5} design value² for Detroit-Ann Arbor PM_{2.5} nonattainment area is 37 $\mu\text{g}/\text{m}^3$, which means that this area is only exceeding the 24-hr standard by 2 $\mu\text{g}/\text{m}^3$. Similarly, the current annual PM_{2.5} design

² Design values are calculated from measured pollutant concentrations in an area and quantify the area's air quality relative to the national standard (see <http://www.epa.gov/air/airtrends/values.html>). For PM_{2.5}, the annual standard is 15 $\mu\text{g}/\text{m}^3$.

value for Detroit-Ann Arbor $\text{PM}_{2.5}$ nonattainment area is $15.4 \mu\text{g}/\text{m}^3$, a value which only exceeds the annual standard by $0.4 \mu\text{g}/\text{m}^3$. As a result, reductions in $\text{PM}_{2.5}$ concentrations of tenths of a $\mu\text{g}/\text{m}^3$ are substantial from an air quality planning perspective, as such reductions could dramatically affect the attainment status of an area such as Detroit-Ann Arbor, in addition to the incremental health benefits associated with such decreases in $\text{PM}_{2.5}$ concentrations. This opinion is similar to conclusions reached during previous CAMx PSAT modeling used to investigate the contribution of power plant SO_2 emissions to particulate sulfate concentrations in the eastern U.S. In that peer-reviewed study, Wagstrom et al (2008) found that SO_2 emissions from power plants significantly impacted areas as far as 500 km from the source region and concluded that impacts of several tenths of a $\mu\text{g}/\text{m}^3$ are significant.

20. Excess emissions and $\text{PM}_{2.5}$ impacts from Monroe Unit 2 are comparable to emissions levels and $\text{PM}_{2.5}$ impacts from entire power plants in the Detroit Edison generating fleet in Michigan. Like the Monroe power plant, Detroit Edison's Belle River, St. Clair, River Rouge, and Trenton Channel plants are all in the Detroit area of southeastern Michigan, as shown in **Figure 15**. Excess SO_2 emissions from Monroe Unit 2 are within about $\pm 10\%$ of 2009 SO_2 emissions from the Belle River, St. Clair, and Trenton Channel plants and are 42% higher than 2009 SO_2 emissions from the River Rouge plant (see **Figure 16**). As a result, impacts on regional $\text{PM}_{2.5}$ concentrations from excess emissions from Monroe Unit 2 are likely to be similar to impacts from the Belle River, St. Clair, and Trenton Channel facilities. For example, CAMx PSAT-derived impacts on annual $\text{PM}_{2.5}$ concentrations from the Trenton Channel power plant, which is

about 18 miles northeast of the Monroe plant, show a similar maximum and spatial distribution as impacts from excess emissions from Monroe Unit 2 (see **Figure 17**).



Figure 15. Locations of Detroit Edison power plants in southeastern Michigan.

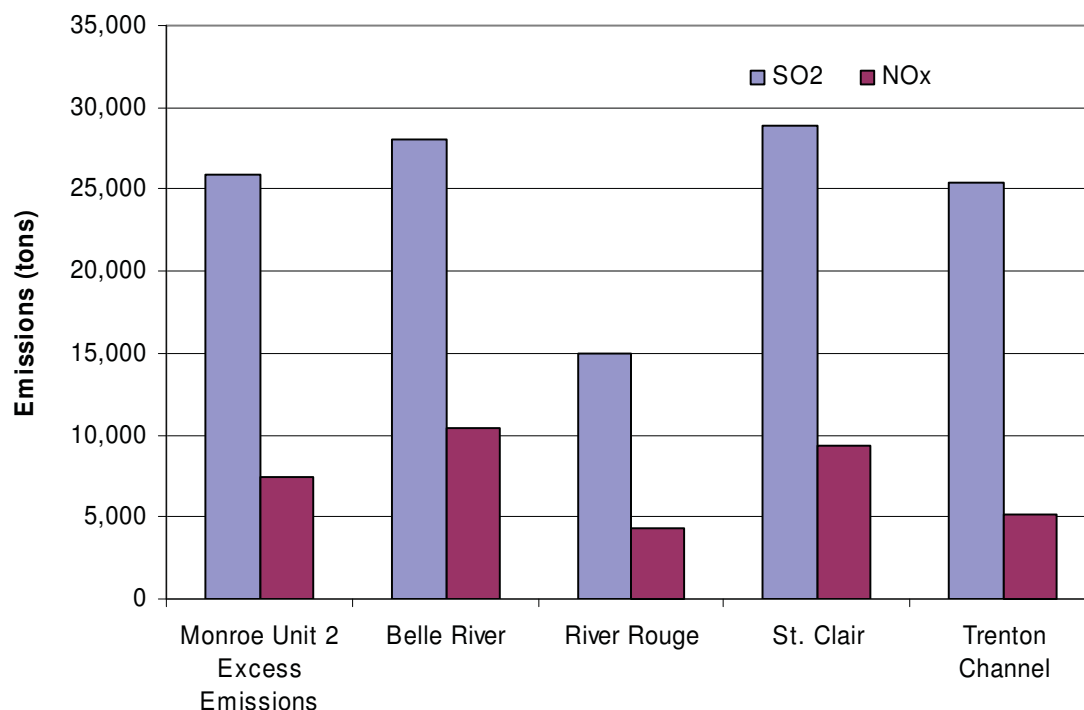


Figure 16. Comparison of excess emissions from Unit 2 of the Monroe power plant to 2009 emissions from other Detroit Edison power plants in Michigan.

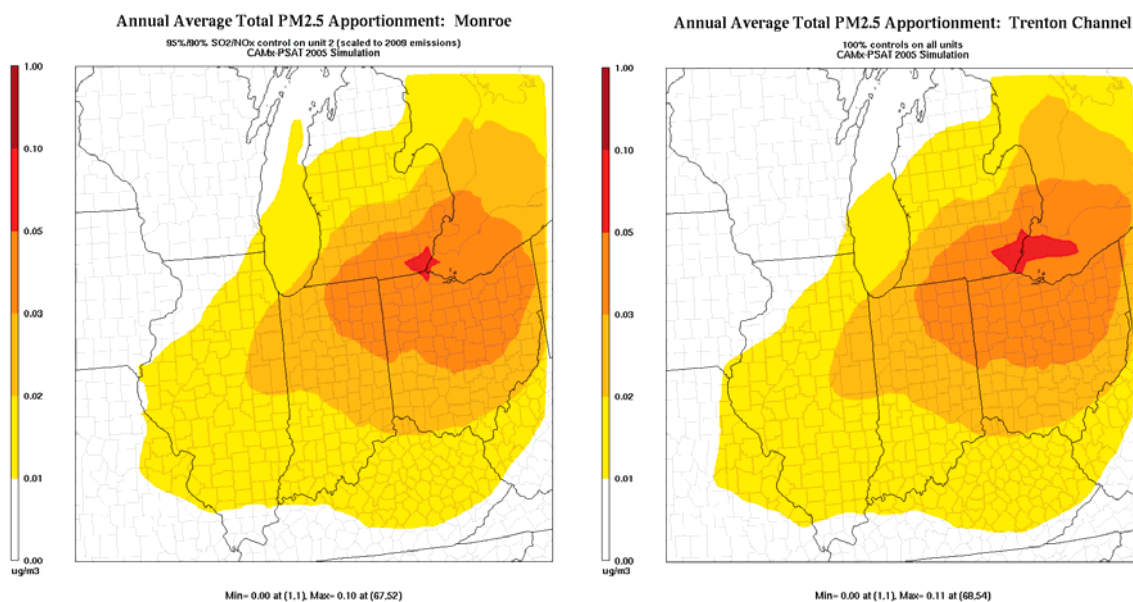


Figure 17. Comparison of CAMx-predicted annual average PM_{2.5} impacts from excess emissions at the Monroe power plant and 2009 emissions from Detroit Edison's Trenton Channel plant.

21. In this region sulfate has been shown to be a greater contributor to PM_{2.5} concentrations than nitrate. Therefore, controlling SO₂ emissions provides greater reductions in PM_{2.5} concentrations in this region than controlling NO_x emissions. It follows that additional SO₂ emission controls could be used instead of NO_x emission controls to achieve the same or greater PM_{2.5} air quality benefits.

22. In addition to the impacts on PM_{2.5} concentrations in areas within EPA's CAMx PSAT modeling domain, excess emissions from Unit 2 of the Monroe plant are likely to impact PM_{2.5} concentrations beyond the boundaries of the modeling domain as well. Under certain conditions, SO₂ may only convert to sulfate at a rate of 1% per hour, which allows the SO₂ to be transported for several days before conversion. Because of such pollutant transport, EPA has encouraged states to address air quality issues such as visibility impairment from a regional perspective, providing funding to five regional planning organizations (RPOs) that address regional haze and related issues across broad geographic areas.

23. Though EPA's CAMx PSAT modeling was focused on quantifying source contributions to PM_{2.5} concentrations, excess NO_x emissions from Monroe Unit 2 would also impact regional ozone concentrations. Ground-level ozone is a secondary pollutant formed through the photochemical reactions of NO_x, VOC, and sunlight, and like PM_{2.5}, ozone can be transported over thousands of kilometers. Previous modeling studies have demonstrated the effectiveness of power plant NO_x controls in decreasing peak 8-hr ozone concentrations in the upper Midwest, including a previous modeling analysis that I performed with the Community Multiscale Air Quality model (CMAQ)³ to investigate

³ CMAQ is another state-of-the-science, peer-reviewed air quality model.

the impact of excess NO_x emissions at the Wabash River power plant in western Indiana (CIVIL ACTION NO. IP99-1693 C-M/S).

24. In conclusion, the excess emissions from the Monroe power plant are currently having a negative impact on the air quality in nearby Detroit, throughout Michigan, in neighboring states, and in other states in the mid-eastern and eastern United States. Several of the areas impacted by the Monroe power plant are not in attainment of the NAAQS, meaning that the excess emissions are adding to areas that already have unhealthy air quality levels. These areas include Detroit-Ann Arbor, Michigan, Cleveland-Akron-Lorain, Ohio, and Milwaukee-Racine, Wisconsin.

25. This declaration does not represent the full extent of my opinions, which may be included in my future expert report(s).

I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 3, 2010, at Petaluma, California



Lyle R. Chinkin

REFERENCES CITED

The following references were cited in the body of this declaration. All other data and information considering in forming the expressed opinions are listed in Appendix E.

Baker K. and Timin B. (2008) PM_{2.5} source apportionment application in support of 24-hr PM_{2.5} NAAQS designation process. Draft report prepared for the U.S. Environmental Protection Agency, Research Triangle Park, NC, August 25.

ENVIRON International Corporation (2008) User's guide - Comprehensive Air Quality Model with Extensions (CAMx). Version 4.50. Prepared by ENVIRON International Corporation, Novato, CA, May. Available on the Internet at <http://www.camx.com/files/CAMxUsersGuide_v4.5.pdf>.

McNally D.E. and Tesche T.W. (1998) Comparative evaluation of the CAMx and UAM-V models over the Northeastern U.S. using the July 1995 OTAG episode and the NARSTO-NE Intensive Field Study data. Prepared for the Mid-Atlantic Regional Air Management Association by Alpine Geophysics, LLC, Arvada, CO.

NOAA-CIRES Climate Diagnostic Center (2003) The NCEP/NCAR Reanalysis Project. NOAA-CIRES Climate Diagnostics Center, Boulder, CO. Available on the Internet at <<http://www.cdc.noaa.gov/cdc/reanalysis/>>.

Russell A. and Dennis R. (2000) NARSTO critical review of photochemical models and modeling. *Atmos. Environ.* **34** (12), 2283-2324.

U.S. Environmental Protection Agency (2010) Policy assessment for the review of the particulate matter national ambient air quality standards—second external review draft. Prepared by the Health and Environmental Impacts Division, Office of Air and Radiation, U.S. Environmental Protection Agency, June.

Wagstrom K.M., Pandis S.N., Yarwood G., Wilson G.M., and Morris R.E. (2008) Development and application of a computationally efficient particulate matter apportionment algorithm in a three-dimensional chemical transport model. *Atmos. Environ.* **42**, 5650-5659.

Williams M. (2010) EPA advisers endorse particulate standards based on visibility. *Environmental Manager Journal*, July.

APPENDIX A

Lyle R. Chinkin Resume

RESUME

LYLE R. CHINKIN

President

**Educational Background**B.S. Atmospheric Science, *summa cum laude*, University of California at Davis, 1981

M.S. Atmospheric Science, University of California at Davis, 1984

1455 N. McDowell Blvd., Suite D

Petaluma, CA 94954-6503

707/665-9900

Fax: 707/665-9800

www.sonomatech.com

Professional Experience

Mr. Chinkin joined Sonoma Technology, Inc. (STI) in 1992 and is STI's President. He has over 20 years of professional consulting experience in air quality and over 5 years of experience at the California Air Resources Board.

Mr. Chinkin is a nationally recognized expert in emission inventory preparation and assessment and air quality analysis. He has worked on projects for federal, state, and local government agencies; universities; public and private research consortiums; and major corporations. Mr. Chinkin's areas of expertise include (1) developing and improving regional emission inventories; (2) providing independent assessments of emission inventories using bottom-up and top-down evaluation techniques; (3) conducting field studies to obtain real-world data and improve activity estimates and emission factors; (4) conducting scoping studies to develop conceptual models of community-scale air quality; (5) assisting with State Implementation Plan (SIP) development; and (6) providing expert testimony and presentations to public boards. He has been appointed to the National Research Council of the National Academy of Sciences Committee on the Effects of Changes in New Source Review Programs for Stationary Sources of Air Pollutants and to a panel to review "Improving Emission Inventories for Effective Air Quality Management Across North America, a NARSTO Assessment".

Mr. Chinkin served as (1) an EPA-invited peer-reviewer of the EPA particulate matter (PM) National Ambient Air Quality Standards Criteria Document and the draft EPA Report on the Environment (ROE) 2006; (2) an expert panel member for the review of the Valdez Air Health Study; and (3) an expert witness for U.S. Department of Justice environmental enforcement actions. Mr. Chinkin was the project manager and co-author of the EPA national guidance document on the preparation of emission inputs for photochemical air quality simulation models. In addition, his projects have included improving estimates of PM and ammonia emissions, evaluating internal combustion engine activity profiles and emissions, determining emissions from propane use and distribution systems, determining air toxic emissions from wood-preservation activities, and improving biogenic emission estimation tools. He frequently directs studies that combine public- and private-sector participation (e.g., an assessment and ground-truth study of industrial emissions in the Houston Ship Channel under the joint direction of the Texas Natural Resource Conservation Commission [now Texas Commission on Environmental Quality] and local industry). Mr. Chinkin has also assisted numerous industrial clients with projects such as development of emission-estimation tools for the American Petroleum Institute and top-down evaluations of emission inventories for the Coordinating Research Council.

Mr. Chinkin is frequently called upon by clients to explain complicated technical information to other air quality professionals, advisory boards, and members of the public. He presented research findings to public advisory committees in Ohio, Kansas, and Missouri and to senior federal and state government officials in Minnesota and at numerous scientific conferences. EPA selected Mr. Chinkin to help prepare a summary of the proceedings of the 2003 NARSTO air quality research conference, and to help an audience of air quality officials from four western U.S. states understand technical air toxics assessment techniques.

Chronology of Education and Work Experience

- 1978 – 1979: Assistant Weather Producer, KCRA-TV Channel 3, Sacramento, CA
 - Decoded weather data and prepared in-studio weather displays for broadcast
- 1979 – 1981: Student Assistant, Meteorology Section, California Air Resources Board
 - Evaluated meteorological data
 - Analyzed isobaric pressure charts and wind flow patterns
- 1980: Weather Reporter, KDVS Radio Station, Davis, CA
 - Prepared and presented weather broadcasts for California
- 1980: Instrument Technician, Air Quality Group, University of California, Davis
 - Maintained and calibrated particulate samplers in remote areas of the western U.S.
- 1981: B.S. Atmospheric Science, *summa cum laude*, University of California at Davis
- 1981 – 1982: Air Pollution Specialist, Analysis and Projects Section, California Air Resources Board
 - Prepared comprehensive technical reports requiring computer programming and statistical analyses
 - Produced the “California Air Quality Data Report”
- 1982 – 1984: Assistant Meteorologist, Meteorology Section, California Air Resources Board
 - Conducted climatological studies relating to air pollution in California
 - Applied meteorological principles to engineering evaluations and statistical analyses
 - Developed guidelines for agricultural burning
- 1984: M.S. Atmospheric Science, University of California at Davis
- 1984 – 1989: Senior Atmospheric Scientist, Systems Applications, Inc., San Rafael, CA
 - Conducted emission inventory studies relating to air pollution in various regions of the U.S.
 - Developed software to process emission inventory data into model-ready inputs for comprehensive 3-dimensional photochemical models
- 1989 – 1992: Manager of Emissions Modeling Group, Systems Applications, Inc., San Rafael, CA
 - Managed emission inventory studies relating to air pollution throughout the U.S. and Asia
 - Conducted air quality studies for government and private industry
- 1992 – 1998: Manager of Emissions Modeling, Sonoma Technology, Inc., Petaluma, CA

- Managed emission inventory studies relating to air pollution worldwide
- Managed air quality studies for government and private industry
- Managed a multi-million dollar level-of-effort contract with the U.S. Environmental Protection Agency for air quality modeling assistance
- 1998: Vice President, Sonoma Technology, Inc., Petaluma, CA
 - Managed emissions modeling group and meteorological programs group
- 1999: Vice President and General Manager, Sonoma Technology, Inc., Petaluma, CA
 - Managed emissions modeling group and meteorological programs group
 - Responsible for financial oversight of company operations including financial performance (e.g., cash flow, profit and loss, backlog and overhead rates)
- 2000: Appointed to the Board of Directors, Sonoma Technology, Inc., Petaluma, CA
- 2002: Senior Vice-President, Sonoma Technology, Inc., Petaluma, CA
- 2004: Appointed to the National Research Council of the National Academy of Sciences Committee on the Effects of Changes in New Source Review Programs for Stationary Sources of Air Pollutants
- 2005: Selected as peer-reviewer for NARSTO report “Improving Emission Inventories for Effective Air Quality Management Across North America”
- 2006 – Present: President, Sonoma Technology, Inc., Petaluma, CA

Professional Memberships

Air & Waste Management Association

American Meteorological Society (1979-1984)

California Registered Environmental Assessor (REA-00715) (1984–1989)

Professional Development

1982: Statistics for Decision Makers

1982: Air Pollution Enforcement Symposium, California Air Resources Board

2001: Understanding Finance and Accounting

Peer Reviewer

U.S. Environmental Protection Agency

Journal of the Air and Waste Management Association

North American Research Strategy for Tropospheric Ozone (NARSTO)

APPENDIX B

LIST OF PUBLICATIONS

This appendix contains the lists of publications for Lyle R. Chinkin.

LYLE R. CHINKIN**Journal Articles**

- McCarthy M.C., Hafner H.R., Chinkin L.R., and Charrier J.G. (2007) Temporal variability of selected air toxics in the United States. *Atmos. Environ.*, doi:10.1016/j.atmosenv.2007.1005.1037 (STI-2894).
- McCarthy M.C., Eisinger D.S., Hafner H.R., Chinkin L.R., Roberts P.T., Black K.N., Clark N.N., McMurry P.H., and Winer A.M. (2006) Particulate matter: a strategic vision for transportation-related research (submitted). (STI-904750-2843).
- Chinkin L.R., Coe D.L., Funk T.H., Hafner H.R., Roberts P.T., Ryan P.A., and Lawson D.R. (2003) Weekday versus weekend emissions activity patterns for ozone precursor emissions in California's South Coast Air Basin. *J. Air & Waste Manag. Assoc.* **53**, pp. 829-843 (STI-999679-2225).
- Funk T.H., Chinkin L.R., Roberts P.T., Saeger M., Mulligan S., Figeroa V.H.P., and Yarbrough J. (2001) Compilation and evaluation of a Paso del Norte emission inventory. *Sci. Total Environ.* (Special Issue: U.S.-Mexico Transboundary Air Pollution Studies) **276**, Nos. 1-3, 135-151 (STI-1942).
- Magliano K.L., Hughes V.M., Chinkin L.R., Coe D.L., Haste T.L., Kumar N., and Lurmann F.W. (1999) Spatial and temporal variations in PM₁₀ and PM_{2.5} source contributions and comparison to emissions during the 1995 Integrated Monitoring Study. *Atmos. Environ.* **33**, 4757-4774.
- Chinkin L.R., Chang D.P.Y., and Floccini R.G. (1986) Relationships among the coefficient of haze, scattering coefficient, and visibility during an agricultural burn season. *J. Air Pollut. Control Assoc.* **36**, 173-178.

Meeting Presentations and Conference Proceedings

- Raffuse S., Gilliland E., Sullivan D., Wheeler N., Chinkin L., Larkin S., Solomon R., Strand T., and Pace T. (2008) Development of wildland fire emission inventories with the BlueSky Smoke Modeling Framework. Presented at the 7th Annual Community Modeling and Analysis System (CMAS) Conference Chapel Hill, NC, October 7, by Sonoma Technology, Inc., Petaluma, CA; U.S. Forest Service AirFIRE Team, Seattle, WA; and U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC (STI-3457).
- Larkin N.K., Strand T., Solomon R., Raffuse S., Sullivan D.C., Chinkin L., Brown T., O'Neill S., Friedl L., and Knighton R. (2008) The state of smoke tools: What we know now. Presented at the International Association of Wildland Fire, The '88 Fires: Yellowstone & Beyond, Jackson Hole, WY, September 22-27, by the U.S. Forest Service AirFire Team, Seattle, WA; Sonoma Technology, Inc., Petaluma, CA; Desert Research Institute, Reno, NV; USDA Natural Resource Conservation Service, Portland, OR; NASA, Washington, D.C.; and USDA Cooperative State Research, Education, and Extension Service, Washington, D.C.
- Raffuse S.M., Sullivan D.C., Gilliland E.K., Chinkin L.R., Larkin S., Solomon R., and Pace T. (2008) Development of wildland fire emission inventories for 2003-2006 and sensitivity analyses. Presentation made at the U.S. Environmental Protection Agency's 17th International Emission Inventory Conference, Portland, OR, June 5, by Sonoma Technology, Inc., Petaluma, CA; U.S. Forest Service AirFire Team, Seattle, WA; and U.S. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, NC (STI-905028-3377).

- Sullivan D.C., Raffuse S.M., Pryden D.A., Craig K.J., Reid S.B., Wheeler N.J.M., Chinkin L.R., Larkin N.K., Solomon R., and Strand T. (2008) Development and applications of systems for modeling emissions and smoke from fires: the BlueSky smoke modeling framework and SMARTFIRE. Paper presented at the 17th International Emissions Inventory Conference, Portland, OR, June 5, by Sonoma Technology, Inc., Petaluma, CA, and the U.S. Forest Service, Seattle, WA (STI-3378).
- Wheeler N.J.M., Craig K.J., Reid S.B., Gilliland E.K., Sullivan D.C., and Chinkin L.R. (2008) The BlueSky Gateway air quality forecast system for fire management. Presented at the BlueSky Smoke Modeling Framework Stakeholders' Meeting, Boise, ID, May 20-22 (STI-905028-3367).
- Raffuse S.M., Sullivan D.C., Chinkin L.R., Pryden D.A., Wheeler N.J.M., Larkin N.K., Solomon R., and Soja A. (2007) Integration and reconciliation of satellite-detected and incident command-reported wildfire information in the BlueSky smoke modeling framework. Presented at the 6th Annual CMAS Conference, Chapel Hill, NC, October 1-3, by Sonoma Technology, Inc., Petaluma, CA, the U.S. Forest Service AirFire Team, Seattle, WA, and the National Institute of Aerospace, Hampton, VA (STI-3227).
- Raffuse S.M., Sullivan D.C., Chinkin L.R., Larkin N.K., Solomon R., and Soja A. (2007) Integration of satellite-detected and incident command-reported wildfire information into BlueSky. Paper No. 205 presented at the Air & Waste Management Association's 100th Annual Conference & Exhibition, Pittsburgh, PA, June 26-29 (STI-3127).
- Reid S.B., Chinkin L.R., Penfold B.M., and Gilliland E.K. (2007) Emissions inventory validation and improvement: a Central California case study. Conference paper prepared for the U.S. Environmental Protection Agency's 16th Annual Emission Inventory Conference, Raleigh, NC, May 14-17, by Sonoma Technology, Inc., Petaluma, CA (STI-3109).
- Raffuse S.M., Sullivan D.C., Chinkin L.R., Larkin S., Solomon R., and Soja A. (2007) Integration of satellite detected and incident command reported wildfire information into BlueSky. Presented at the BlueSky Annual Meeting, Winthrop, WA, May 22, by Sonoma Technology, Inc., Petaluma, CA, U.S. Forest Service AirFire Team, Seattle, WA, and the National Institute of Aerospace, Hampton, VA (STI-3086).
- Chinkin L. and Reid S. (2006) Improvements to the spatial and temporal representativeness of modeling emission estimates. Presentation to the CCOS Technical Committee, Sacramento, CA, STI-906036.01-2995, July 6.
- Reid S.B., Brown S.G., McCarthy M.C., and Chinkin L.R. (2006) Comparison of ambient measurements to emissions representations for modeling in California's San Joaquin Valley. Presented to the *U.S. Environmental Protection Agency's 15th Annual Emission Inventory Conference, New Orleans, LA, May 18*, by Sonoma Technology, Inc., Petaluma, CA (STI-2944).
- Raffuse S.M., Sullivan D.C., Chinkin L.R., Larkin S., and Solomon R. (2006) Expanding BlueSkyRAINS to support emission inventory preparation. Presented at the *U.S. Environmental Protection Agency's 15th Annual Emission Inventory Conference, New Orleans, LA, May 17*, by Sonoma Technology, Inc., Petaluma, CA, and U.S. Department of Agriculture, Forest Service, Seattle, WA (STI-2950).
- Hafner H.R., McCarthy M.C., and Chinkin L.R. (2006) National, regional, between-city, and within-city spatial variability in air toxics. Presented at the *AWMA Symposium on Air Quality Measurement Methods and Technology, Durham, NC, May 9*, by Sonoma Technology, Inc., Petaluma, CA (STI-2884).
- Hafner H.R., McCarthy M.C., and Chinkin L.R. (2006) Temporal trends in air toxics. Presented at the *AWMA Symposium on Air Quality Measurement Methods and Technology, Durham, NC, May 9*, by Sonoma Technology, Inc., Petaluma, CA (STI-2885).
- Chinkin L.R. (2005) Comparison of ambient measurements to emissions representations in modeling. Presentation at the California Air Resources Board, CCOS Technical Committee, Sacramento, CA, by Sonoma Technology, Inc., Petaluma, CA, STI-905044-2838, October.

- Hafner H.R., McCarthy M.C., and Chinkin L.R. (2005) National air toxics assessments: lessons learned in quantifying ambient air toxics temporal and spatial trends. Presented at the *2005 Air Toxics Summit, Seeking Solutions for our Rural and Urban Communities, Portland, OR, October 18-19* by Sonoma Technology, Inc., Petaluma, CA (STI-905102-2756).
- McCarthy M.C., Hafner H.R., Chinkin L.R., Cozzo E.M., Raffuse S.M., and Gray E.A. (2005) Air toxics monitoring data analysis workshop. Presentation prepared for the U.S. Environmental Protection Agency, Raleigh, NC, by Sonoma Technology, Inc., Petaluma, CA, STI-905102-2799, September.
- Wheeler N.J., Chinkin L.R., Reid S.B., Gross T., Hawkins A., Watson D., Vit W., Mefrakis R., and Joerke J. (2005) Regional photochemical modeling for the Kansas City Clean Air Action Plan: what it tells us about the challenges ahead for 8-hr ozone nonattainment areas. Presented at the *4th Annual CMAS Models-3 User's Conference, Chapel Hill, NC, September 26-28*, by Sonoma Technology, Inc., Petaluma, CA; Missouri Department of Natural Resources, Jefferson City, MO; Mid-America Regional Council, Kansas City, MO (STI-2800).
- Raffuse S.M., Brown S.G., Sullivan D.C., and Chinkin L.R. (2005) Estimating regional contributions to atmospheric haze. Presented at the *2005 ESRI International User Conference, San Diego, CA, July 26* (STI-2649).
- Raffuse S.M., Sullivan D.C., and Chinkin L.R. (2005) Emission impact potential - a method for relating upwind emissions to ambient pollutant concentrations. Presented at the *U.S. Environmental Protection Agency 14th International Emission Inventory Conference, Las Vegas, NV, April 11-14* by Sonoma Technology, Inc., Petaluma, CA (STI-2715, STI-2722).
- Reid S.B., Sullivan D.C., Stiefer P.S., and Chinkin L.R. (2005) Development of emission inventories of recreational boats and commercial marine vessels for the Central States Regional Air Planning Association. Presented at the *U.S. Environmental Protection Agency 14th International Emission Inventory Conference, Las Vegas, NV, April 11-14* by Sonoma Technology, Inc., Petaluma, CA (STI-2714, STI-2721).
- Sullivan D.C., Reid S.B., Penfold B.M., and Chinkin L.R. (2005) Development of agricultural dust emission inventories for the Central States Regional Air Planning Association. Presented at the *U.S. Environmental Protection Agency 14th International Emission Inventory Conference, Las Vegas, NV, April 11-14* by Sonoma Technology, Inc., Petaluma, CA (STI-2713, STI-2720).
- Sullivan D.C., Reid S.B., Stiefer P.S., Funk T.H., and Chinkin L.R. (2005) On-road mobile source emission inventory development for the Central States Regional Air Planning Association. Presented at the *U.S. Environmental Protection Agency 14th International Emission Inventory Conference, Las Vegas, NV, April 11-14* by Sonoma Technology, Inc., Petaluma, CA (STI-2712, STI-2719).
- Reid S.B., Funk T.H., Sullivan D.C., Stiefer P.S., Arkinson H.L., Brown S.G., and Chinkin L.R. (2004) Research and development of emission inventories for planned burning activities for the Central States Regional Air Planning Association. Paper for the *13th International Emission Inventory Conference "Working for Clean Air in Clearwater", Clearwater, FL, June 8-10* (STI-2515).
- Wheeler N.J.M., Lurmann F.W., Hafner H.R., Chinkin L.R., Sullivan D.C., and Roberts P.T. (2004) Changing roles of oxides of nitrogen as precursors in photochemistry. Presentation at the *Annual Meeting of the West Coast Section, Air & Waste Management Association, Ventura, CA, May 13*, STI-2539.
- Bahm K.E., Chinkin L.R., Sullivan D.C., and Broaders K.E. (2004) Task 4.3: detecting source activities and reconciling ambient measurement variations with field observations. Presented to *California Regional PM₁₀/PM_{2.5} Air Quality Study (CRPAQS) Data Analysis Workshop, Sacramento, CA, March 9-10* by Sonoma Technology, Inc., Petaluma, CA (STI-902328-2501).

- Coe D.L., Chinkin L.R., Reid S.B., and Stiefer P.S. (2003) Weekday-weekend emissions patterns for southern California: observations and implications. Presented at the *NARSTO Workshop on Innovative Methods for Emission-Inventory Development and Evaluation, University of Texas at Austin, October 14-17* (STI-2421).
- Chinkin L.R., Coe D.L., Hafner H.R., and Tamura T.M. (2003) Air Toxics Emission Inventory Training Workshop. Sponsored by the U.S. Environmental Protection Agency, Region IX, Richmond, CA. Prepared by Sonoma Technology, Inc., Petaluma, CA, 903320-2398, July 15-16.
- Coe D.L., Gorin C.A., Chinkin L.R., and Reid S.B. (2003) Observations of weekday-weekend activity patterns for area sources in the Los Angeles area. Paper and presentation prepared for and presented at the U.S. Environmental Protection Agency, *12th International Emission Inventory Conference "Emission Inventories - Applying New Technologies", San Diego, CA, April 28 - May 1* (STI-2278).
- Coe D. L., Chinkin L.R., Stiefer, P.S., and Funk T.H. (2003) Observations of weekday-weekend activity patterns for on-road mobile sources in the Los Angeles area. Presented at the *13th Annual Coordinating Research Council (CRC) On-Road Vehicle Emissions Workshop, San Diego, CA, April 7-9, 2003* (STI-2277).
- Chinkin L.R. and Ryan P.A. (2002) Recommended improvements to the CMU Ammonia Emission Inventory Model for use by LADCO. Paper prepared for and presented at the Midwest RPO Emissions Inventory Meeting, Des Plaines, IL, November 20, by Sonoma Technology, Inc., Petaluma, CA (STI-902350-2280).
- Chinkin L.R., MacDonald C.P., Funk T.H., Crews J.M., Dye T.S., and Wheeler N.J.M. (2002) Preliminary assessment of ozone air quality in the Minneapolis/St. Paul region. Presented at the Minnesota Environmental Initiative Clean Air Minnesota Rollout, St. Paul, MN, October 30, STI-901104-901105-2242.
- Coe D.L., Gorin C.A., and Chinkin L.R. (2002) Emission inventories of OCS production and development activities in the Gulf of Mexico. Presentation at U.S. Department of Interior, Minerals Management Service, New Orleans, LA, September (STI-998203-2262).
- Wheeler N., Lurmann F., Chinkin L., LeBaron B., Barickman P., Eden J., and Cruickshank T. (2002) Wintertime particulate matter modeling issues in the western United States. Presented at *Coordinating Research Council (CRC) Toxics Modeling Conference, The Woodlands, TX, February 27* (STI-2159).
- Chinkin L.R. and Coe D.L. (2002) ARB weekday and weekend emissions studies of the 2002 ozone season. Presented to the California Air Resources Board Weekend Effect Work Group Meeting, Sacramento, CA, February 20, STI-901150-2157.
- Wheeler N.J.M., Lurmann F.W., Ryan P.A., Roney J.A., Roberts P.T., MacDonald C.P., Chinkin L.R., Coe D.L., Hanna S., Seaman N., Hunter G., and Scalfano D. (2001) The SO₂ and NO₂ Increment Analysis for the Breton National Wilderness Area. Presented for the Minerals Management Service and Scientific Review Board, New Orleans, LA, December 13, STI-901369-2135.
- Coe D.L., Ryan P.A., Funk T.H., and Chinkin L.R. (2001) DOE/OHVT weekday-weekend study: emissions activity results. Presented at the Weekday/Weekend Effect Workgroup, California Air Resources Board, Sacramento, CA, by Sonoma Technology, Inc., Petaluma, CA, STI-999677-2124, October 23.
- Funk T.H., Coe D.L., and Chinkin L.R. (2001) Weekday versus weekend mobile source emissions activity patterns in California's South Coast Air Basin. Paper presented at the *International Emission Inventory Conference, Denver, CO, April 30 to May 3* (STI-2065).
- Funk T.H. and Chinkin L.R. (2001) Using GIS technology for emission inventory and air quality applications. Presented at the *SCOS97-NARSTO Data Analysis Conference, February 13-15*, STI-2059.
- Funk T.H. and Chinkin L.R. (2001) Development of spatial allocation factors for the SCOS97 domain. Presented at the *SCOS97-NARSTO Data Analysis Conference, February 13-15* (STI-2053).

- Roberts P.T., Funk T.H., MacDonald C.P., Main H.H., and Chinkin L.R. (2000) Weekday/weekend ozone observations in the South Coast Air Basin. Presented to California Air Resources Board, Sacramento, CA, by Sonoma Technology, Inc., Santa Rosa, CA, STI-999670-1966, April 13.
- Funk T.H. and Chinkin L.R. (1999) The use of PAMS data to evaluate emission inventory estimates in California. Preprints in *Emission Inventory Regional Strategies for the Future*, Raleigh, NC, October 26-28, Air & Waste Management Association, Pittsburgh, PA (STI 1876).
- Haste T.L., Kumar N., Chinkin L.R., Roberts P.T., Saeger M., Mulligan S., and Yarbrough J. (1999) Compilation and evaluation of a Paso del Norte emission inventory for use in photochemical dispersion modeling. Paper no. 99-190 presented at the *Air & Waste Management Association 92nd Annual Meeting & Exhibition*, St. Louis, MO, June 20-24 (STI 1862).
- Chinkin L.R., Haste T.L., Coe D.L., Puri A.K., Hall J.V., and Levy S. (1998) Emission inventory projection project. Presented at *Air & Waste Management Association's Emission Inventory: Living in a Global Environment*, New Orleans, LA, December 8-10 (STI 1840).
- Haste T.L., Kumar N., Chinkin L.R., Roberts P.T., Saeger M., Mulligan S., Figueroa V.H.P., and Yarbrough J. (1998) Compilation and evaluation of a Paso del Norte emission inventory for use in photochemical dispersion modeling. Presented at the *Air & Waste Management Association's Emission Inventory: Living in a Global Environment*, New Orleans, LA, December 8-10 (STI 1839).
- Wilkinson J.G., Chinkin L.R., Coe D.L., Fitz D., Loomis C.F., Magliano K., Pankratz D., Ringler E., Waldron T., and Zwicker J. (1998) A model to estimate temporally resolved ammonia emissions at a dairy. *91st Annual Air & Waste Management Association Meeting & Exhibition*, San Diego, CA, June 14-18.
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APPENDIX C

STATEMENT OF COMPENSATION

Sonoma Technology, Inc. (STI) has been compensated at \$290 per hour for Lyle R. Chinkin's services to the United States Department of Justice (USDOJ). For any deposition or trial testimony the USDOJ will compensate STI at a rate of 150% of Mr. Chinkin's rates in effect at the time the testimony is provided.

APPENDIX D

PREVIOUS EXPERT TESTIMONY

I, Lyle R. Chinkin, have testified as an expert witness at a trial or deposition in the past four years. The cases in which I have testified are as follows:

- United States of America, et al. v. Cinergy Corp., et al. C.A. No. IP99-1693 C-M/S
- State of North Carolina ex rel. Roy Cooper, Attorney General v. Tennessee Valley Authority, Civil Action No. 1:06CV20, (W.D.N.C.)

APPENDIX E

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APPENDIX F

ELECTRONIC FILES

This appendix describes the electronic files provided with this report.

Daily CAMx PSAT Results

Plots showing year-2005 daily impacts of excess emissions from the Monroe Power Plant on regional PM_{2.5} concentrations are included on a CD appended to this report. Plots are provided in animated GIF and PDF formats for all 364 days modeled with CAMx PSAT.